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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/764,606	01/23/2004	Nobuo Shimizu	9319A-000658	6155

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EXAMINER

CHEN, ERIC BRICE

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 02/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/764,606

Applicant(s)

SHIMIZU ET AL.

Examiner

Eric B. Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25, 27 and 29-35 is/are pending in the application.
- 4a) Of the above claim(s) 22-25, 27 and 29-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/23/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Election/Restrictions

2. Applicant's election of Invention I, method claims 1-23 in the reply filed on Dec. 14, 2005 is acknowledged. Claims 22-25, 27, and 29-35 do not belong to the elected group because they belong to a separate statutory class. Burden still exists because a separate search is required for product claims 22-25, 27, and 29-35.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-9, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya et al. (U.S. Patent No. 6,469,832), in view of Kanda (U.S. Patent No. 5,876,267).
5. As to claim 1, Yotsuya discloses a method of manufacturing a substrate with a plurality of concave portions (column 2, lines 66-67; column 3, lines 1-7; Figure 1), the

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method comprising the steps of: forming a mask (6) on the substrate (2) (column 6, lines 53-54; Figure 5A); forming a plurality of initial holes (61) on the mask (6) (column 7, lines 22-29); and forming the plurality of concave portions (3) in the substrate (2) by subjecting the mask (6) with the plurality of initial holes (61) to an etching process (column 7, lines 36-46; Figure 5C).

6. Yotsuya does not expressly disclose that the initial holes (61) are formed by means of a physical method. However, Kanda discloses that blasting (a physical method) is a method used for the precision engraving (column 1, lines 5-19) or precision machining of workpieces, including glass, silicon, ceramics or other materials used for electronic components (column 3, lines 10-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the initial holes by means of a physical method. One who is skilled in the art would be motivated to use blasting, a physical method used for precision engraving or precision machining of workpieces.

7. As to claim 2, Kanda discloses that the physical method includes blast processing (column 1, lines 5-19).

8. As to claim 3, Kanda discloses that the blast processing is carried out using glass beads as blast media (column 1, lines 5-8).

9. As to claim 4, Kanda discloses that the blast processing is carried out using blast media of which average diameter is in the range of 20 to 200 μm (column 9, lines 48-50).

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10. As to claim 5, Kanda discloses that the blast processing is carried out by spraying blast media with the blast pressure in the range of 1 to 10 kg/cm² (column 11, lines 20-21, Table 1).

11. As to claim 6, Kanda does not expressly disclose that the blast processing is carried out by spraying blast media so as to have a blast density in the range of 10 to 100 kg/m². However, Kanda teaches that the injection density of an abrasive (g/s) can be enlarged or changed, depending on the desired process pattern (column 12, lines 3-6, lines 12-15). Kanda's injection density is similar to Applicants' blast density because both parameters are the measure of the total weight of blast media that is consumed. In teaches that injection density may be varied, Kanda suggests that this parameter appears to reflect a result-effective variable which can be optimized. See MPEP § 2144.05 (II). Injection density (or blast density) may be varied according, depending on the desired outcome of the blast process, such as machining a processing pattern to a desired shape. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the blast processing by spraying blast media so as to have a blast density in the range of 10 to 100 kg/m². One who is skilled in the art would be motivated to optimize through routine experimentation of blast power. See MPEP § 2144.05 (II).

12. As to claim 7, Yotsuya discloses that the mask (6) is formed of Cr (column 6, lines 60-61).

13. As to claim 8, Yotsuya discloses that the average thickness of the mask is in the range of 0.05 to 2.0 μm (column 6, lines 64-66).

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14. As to claim 9, Yotsuya discloses that the etching process includes a wet etching process (column 7, lines 36-46).

15. As to claim 11, Yotsuya discloses the step of removing the mask (6) after the etching process (column 7, lines 46-48; Figure 5D).

16. As to claim 13, Yotsuya discloses that the plurality of concave portions are provided for microlenses (column 7, lines 57-62; Figure 5D).

Claim Rejections - 35 USC § 103

17. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya, in view of Kanda, in further view of Wolf et al., *Silicon Processing for the VLSI Era*, Vol. 1, Lattice Press (1986).

18. As to claim 10, Yotsuya does not expressly disclose that the wet etching process is carried out using ammonium hydrogen difluoride or ammonium fluoride as an etchant. However, Wolf teaches that ammonium fluoride is a commonly used component for etching SiO₂ (or glass) (pages 532-33). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the wet etching process using ammonium fluoride as an etchant. One who is skilled in the art would be motivated to use an etchant that is known to be effective for etching glass.

Claim Rejections - 35 USC § 103

19. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya, in view of Kanda, in further view of Shell (U.S. Patent No. 4,012,263).

20. As to claim 10, Yotsuya does not expressly disclose that the substrate is constituted from alkali-free glass. However, Shell teaches that alkali-free glass has superior working properties, including low to moderate thermal expansion and superior glass quality (column 1, lines 5-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a substrate constituted from alkali-free glass. One who is skilled in the art would be motivated to use glass with superior working properties, including low to moderate thermal expansion and superior glass quality.

Claim Rejections - 35 USC § 103

21. Claims 14-17, 19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya, in view of Borelli et al. (U.S. Patent Appl. Pub. No. 2003/0007772).

22. As to claim 14, Yotsuya discloses a method of manufacturing a substrate with a plurality of concave portions (column 2, lines 66-67; column 3, lines 1-7; Figure 1), the method comprising the steps of: forming a mask (6) on the substrate (2) (column 6, lines 53-54; Figure 5A); forming a plurality of initial holes (61) in the mask (6) (column 7, lines 22-29); and forming the plurality of concave portions (3) in the substrate (2) by subjecting the mask (6) with the plurality of initial holes (61) to an etching process (column 7, lines 36-46; Figure 5C).

23. Yotsuya does not expressly disclose that the initial holes (61) are formed by means of irradiation with laser beams. However, Borelli discloses that irradiation with

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laser beams is a method used to form holes of fine spacial accuracy in workpieces such as glass (paragraph 0045). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the initial holes by means of irradiation with laser beams. One who is skilled in the art would be motivated to use irradiation with laser beams to form holes with fine spacial accuracy.

24. As to claim 15, Yotsuya discloses that the mask (6) is formed of Cr (column 6, lines 60-61).

25. As to claim 16, Yotsuya discloses that the average thickness of the mask is in the range of 0.05 to 2.0 μm (column 6, lines 64-66).

26. As to claim 17, Yotsuya discloses that the etching process includes a wet etching process (column 7, lines 36-46).

27. As to claim 19, Yotsuya discloses the step of removing the mask (6) after the etching process (column 7, lines 46-48; Figure 5D).

28. As to claim 21, Yotsuya discloses that the plurality of concave portions are provided for microlenses (column 7, lines 57-62; Figure 5D).

Claim Rejections - 35 USC § 103

29. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya, in view of Borelli, in further view of Wolf.

30. As to claim 18, Yotsuya does not expressly disclose that the wet etching process is carried out using ammonium hydrogen difluoride or ammonium fluoride as an etchant. However, Wolf teaches that ammonium fluoride is a commonly used component for

etching SiO₂ (or glass) (pages 532-33). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the wet etching process using ammonium fluoride as an etchant. One who is skilled in the art would be motivated to use an etchant that is known to be effective for etching glass.

Claim Rejections - 35 USC § 103

31. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yotsuya, in view of Borelli, in further view of Shell.

32. As to claim 10, Yotsuya does not expressly disclose that the substrate is constituted from alkali-free glass. However, Shell teaches that alkali-free glass has superior working properties, including low to moderate thermal expansion and superior glass quality (column 1, lines 5-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a substrate constituted from alkali-free glass. One who is skilled in the art would be motivated to use glass with superior working properties, including low to moderate thermal expansion and superior glass quality.

Conclusion

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yashashita et al. (U.S. Patent No. 6,407,666) discloses a method of manufacturing a glass microlens substrate with a plurality of concave portions. Shimizu et al. (U.S. Patent No. 6,618,200) discloses a method of forming a

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microlens substrate with a plurality of concave portions. Dings et al. (U.S. Patent No. 5,593,528) discloses a method of forming holes in ceramic substrates by blast processing with abrasive particles.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBC
Feb. 9, 2006

SEARCHED

EXAMINER

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